

SPECIFICATION

PUMP

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to a pump, and particularly to a pump having a high compression ratio and can fully exhaust fluid drawn into the chamber and preventing overheating during a compression cycle.

2. PRIOR ART

[0002] In general, a pump includes a body in which a chamber, an inlet and an outlet both in communication with the chamber are defined, and rotors rotatably and fitly received in the chamber as close running fit. Fluid is drawn into the chamber through the inlet and expelled out through the outlet by the rotors. Pumps are applied in different fields as different apparatuses such as a vacuum air pump, an air compressor pump, and a compressor pump. Conventional pumps were disclosed in Taiwan patent application Nos. 88112386, 88115060, 89210884, 89213279, 91213279, 91206505 and 91111929 and US patent Nos. 2,164,462, 3,188,822, 3,426,525 and 4,138,848.

[0003] However, each conventional pump has a dead compression zone due to the configuration of the rotors. The dead compression zone makes some of the compressed fluid remain in the chamber during a compression cycle, which reduces the transporting volume of the compressed fluid and the compression ratio of the pump. Thus, the fluid drawn into the chamber cannot be fully exhausted by the conventional pump.

[0004] In the former case, fluid might be not secured to inpour and flux the chamber during a compression cycle in view of the leavings fluid should

affects the fluid into the chamber, resulting in reflux which adversely affects fluid flowing into the chamber. In other words, only an inlet and an outlet of the chamber cannot resist reflux therefrom. Thus, it is complicated to control the compression ratio of the pump, such as the compression ratio and the transporting volume of the pump is further affected.

[0005] In addition, the rotors are fitly received in the chamber as close running fit. It is complicated to fabricate the rotors and the chamber due to the close running fit. Furthermore, the phenomena of thermal expansion appear on the rotors during the compression cycle, which adversely affects the close running fit and causes friction between the rotors and the chamber. Additionally, the chamber have scale at inner wall of the chamber after a period of use and so reduce the size thereof, which also adversely affects the close running fit and causes friction between the rotors and the chamber. Thus, the pump may be overheated due to the friction and so can not work normally.

SUMMARY OF THE INVENTION

[0006] Accordingly, an object of the present invention is to provide a pump with a high compression ratio and without a dead compression zone and can fully exhaust fluid drawn into a chamber of the pump.

[0007] Another object of the present invention is to provide a pump which is ready to control the compression ratio thereof.

[0008] Further object of the present invention is to provide a pump have good performance between the rotors and the chamber, in which the rotors is able to clean inner wall of the chamber during a compression cycle, and a buffer area which is a channel defined in a body in communication with the chamber, which is ready to fabricate and prevents overheating during a

compression cycle thereby facilitating to work stably.

[0009] To achieve the above-mentioned objects, a pump in accordance with the present invention includes a body, and first and second rotors. A chamber is defined in the body. First and second inlets and first and second outlets are defined in the body in communication with the chamber, and each of which has a check valve therein for preventing reflux therefrom. The first rotor is rotatably received in the chamber and connected with a first shaft. The first rotor is generally circular with a blade extending outward therefrom. The blade includes first and second mating surfaces. A third mating surface is formed at the blade between the first and second mating surfaces. The second rotor is rotatably received in the chamber and connected with a second shaft. The second rotor is generally circular with an engaged recess inward defined therein for mating with the blade of the first rotor. The engaged recess includes first and second engaged surfaces for mating with the first and second mating surfaces. A third engaged surface is formed at the bottom of the engaging recess between the first and second engaged surfaces for mating with the third mating surface of the blade.

[0010] Other objects, advantages and novel features of the present invention will be drawn from the following detailed embodiment of the present invention with attached drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Fig. 1 is a schematic side elevational view of a pump in accordance with an embodiment of the present invention;

[0012] Fig. 2 is an enlarged schematic side elevational view showing a first rotor mating with a second rotor;

[0013] Figs. 3A-3I are schematic side elevational views of successive positions of the first and second rotors for explaining and understanding the operation of the pump;

[0014] Fig. 4 is a schematic side elevational view showing the first rotor with two blades and the second rotor with corresponding two engaged recesses;

[0015] Fig. 5 is a schematic side elevational view showing the first rotor with three blades and the second rotor with corresponding three engaged recesses;

[0016] Figs. 6 is a schematic side elevational view showing a first rotor and a second rotor in accordance with another embodiment of the present invention;

[0017] Figs. 7 and 8 are schematic side elevational views of successive positions of the first and second rotors for explaining and understanding the second rotor wiping inner wall of the chamber.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Referring to Fig. 1, a pump 1 of the present invention includes a body 2 and first and second rotors 3, 4. A chamber 20 is defined in the body 2 and includes first and second circular portions in communication with each other. The first and second portions of the chamber 20 respectively receive the first and second rotors 3, 4 therein. First and second inlets 21, 22 and first and second outlets 23, 24 are defined in the body 2 in communication with the chamber 20. The first inlet 21 is opposite to the second outlet 24 which is defined between the first outlet 23 and the second inlet 22. Each of the first and second inlets 21, 22 and the first and second outlets 23, 24 has a check valve (not shown) therein for

preventing reflux therefrom. A channel 25 is defined in the body 2 in communication with the second portion of the chamber 20 and surrounds an end of the chamber 20 for providing a buffer area thereby absorbing offset of the second rotor 4 during a compression cycle. Thus, friction between the second rotor 4 and the body 2 is reduced thereby preventing overheating.

[0019] The first rotor 3 connects with a first shaft 30 which connects with a motor (not shown) for being driven to rotate. The first rotor 3 is generally circular with a blade 31 extending outward therefrom. Also referring to Fig. 2, the blade 31 includes symmetrical first and second mating surfaces 311, 312. The profile curve of the first mating surface 311 is a reflection curve of that of the second mating surface 312. A third mating surface 313 is formed at the blade between the first and second mating surfaces 311, 312.

[0020] The second rotor 4 connects with a second shaft 40 which connects with the motor for being driven to rotate. The second rotor 4 is generally circular with an engaged recess 41 inward defined therein for mating with the blade 31 of the first rotor 3. Also referring to Fig. 2, the engaged recess 41 includes symmetrical first and second engaged surfaces 411, 412 for mating with the first and second mating surfaces 311, 312. The profile curves of the first and second engaged surfaces 411, 412 are conjugate curves of those of the first and second mating surfaces 311, 312, respectively. A third engaged surface 413 is formed at the bottom of the engaged recess 41 between the first and second engaged surfaces 411, 412 for mating with the third mating surface 313 of the blade 31.

[0021] Referring to Figs. 3A-3I, successive positions of the first and second rotors 3, 4 are shown for explaining and understanding the operation of the pump 1. Figs. 3A-3D show that fluid is drawn into the chamber 20

through the check valves of the first and second inlets 21, 22. Figs. 3E-3G show that the first and second mating surfaces 311, 312 of the first rotor 3 rotatably mate with the first and second engaged surfaces 411, 412 of the second rotor 4 thereby compressing and exhausting the fluid through the check valves of the first and second outlets 23, 24. Further rotation of the first and second rotors 3, 4 makes the third mating surface 313 mate with the third engaging surface 413 thereby continuously expelling the fluid out of the chamber 20 through the first and second outlets 23, 24. Referring to Figs. 3H-3I, at the end of the compression cycle, it is a start to draw the fluid into the chamber 20 through the first inlet 21. Since the channel 25 absorbs offset of the second rotor 4 during the compression cycle, friction between the second rotors 4 and body 2 is reduced thereby preventing overheating during the compression cycle.

[0022] As mentioned above, due to the configuration of the first and second rotors 3, 4, and the check valves of the inlets 21, 22 and the outlets 23, 24, the pump 1 of the present invention can fully exhaust the fluid through the outlets 23, 24 and ready to control the compression ratio thereof. Thus, the pump 1 has a high compression ratio and a high transporting volume. Due to the channel 25, the second rotor 4 is not close running fit with the chamber 20 and so the pump 1 of the present invention is ready to fabricate. Since the channel 25 absorbs offset of the second rotor 4 during the compression cycle thereby reducing friction between the second rotor 4 and the body 2, the pump 1 prevents overheating during the compression cycle thereby facilitating to work stably.

[0023] Referring to Figs. 4-5, the first and second rotors 3', 4' may have more than one blade 31' and recesses engaged 41' respectively. In Fig. 4, two blades 31' are symmetrically formed at the first rotor 3' and two engaged recesses 41' are symmetrically defined in the second rotor 4' for respectively mating with the two blades 31'. In Fig. 5, three blades 31' are

equally spacedly formed at the first rotor 3' and three engaging recesses 41' are equally spacedly defined in the second rotor 4' for respectively mating with the three blades 31'.

[0024] A pump of another embodiment of the present invention is shown in Figs. 6-8. Compared with the above-mentioned embodiment, the channel 25 of the above-mentioned embodiment is not defined in body of the another embodiment. The blade of the first rotor 3'' and the engaged recess of the second rotor 4'' of the pump in accordance with the another embodiment are differently configured compared with the above-mentioned embodiment. The profile curve of the first mating surface 311'' of the first rotor 3'' is a reflection curve of that of the second mating surface 312'' but has a different curve length from that of the second mating surface 312''. The profile curves of the first and second engaged surfaces 411'', 412'' are conjugate curves of those of the first and second mating surfaces 311'', 312'', respectively. During the compression cycle, an apex 414'' formed at the junction of the first engaging surface 411'' and a peripheral surface of the second rotor 4'' wipes an inner wall 201'' of the chamber 20'' to clean the inner wall 201'' thereby preventing the inner wall 201'' from begriming. Thus, friction between the rotor 4'' and the body 2'' is reduced thereby preventing overheating during the compression cycle.

[0025] It is understood that the invention may be embodied in other forms without departing from the spirit thereof. Thus, the present examples and embodiments are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.